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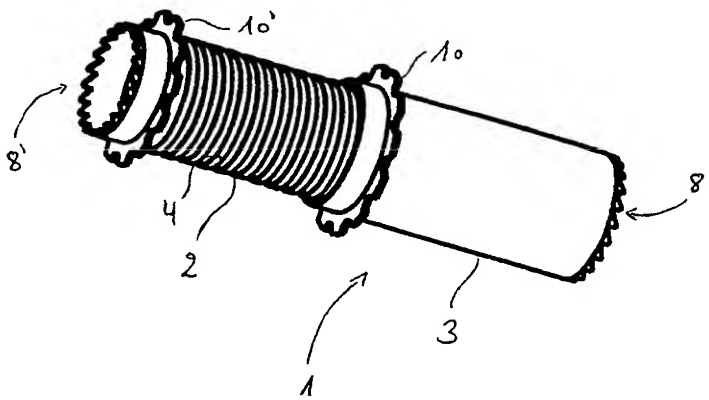
(54) Title: A METHOD OF FORMING A CAVITY IN THE CASTING OF PREFERABLY PARALLEL EARTH WALLS, A SLEEVE FOR EMBEDDING IN CONCRETE, AND A USE AS WELL AS A METHOD OF MAKING SUCH A SLEEVE




(57) Abstract: The invention relates to a method of forming a cavity in the casting of preferably parallel earth walls, said method comprising embedding and use of a sleeve which comprises an essentially tubular male part and an essentially tubular female part, wherein the outer wall of the male part has outer threads which are in engagement with corresponding inner threads of the female part, and wherein mutual rotation of the male part and the female part causes the male part to be displaced relatively to the female part. New aspects are inter alia that the male part and/or the female part comprises a means intended for breaking through the surface of the earth walls for forming an engagement with it, said means being rotated so as to saw a ring-shaped hole in the earth wall. The invention moreover relates to a sleeve which is suitable for embedding in concrete, and which is essentially tubular and has a variable length. The ends of the sleeve are provided with means for engagement with the preferably parallel earth walls formed for the casting, said means being intended for braking through the surface of the earth wall for arrangement of the means at a certain depth in the earth wall.

WO 02/14624 A1

**A method of forming a cavity in the casting of preferably parallel earth walls, a sleeve for embedding in concrete, and a use as well as a method of making such a sleeve**

The present invention relates to a method of forming a cavity in the casting of preferably parallel earth walls, said method comprising embedding and use of a sleeve which comprises an essentially tubular male part and an essentially tubular female part, wherein the outer wall of the male part has outer threads which are in engagement with corresponding inner threads of the female part, and wherein mutual rotation of the male part and the female part causes the male part to be displaced relatively to the female part.

The invention moreover relates to a sleeve suitable for embedding in concrete, wherein the sleeve is essentially tubular and has a variable length, wherein the ends of the sleeve are provided with means for engagement with the preferably parallel earth walls formed for the casting, and wherein the sleeve comprises an essentially tubular male part and an essentially tubular female part, wherein the female part is slidably arranged in the male part, and wherein the outer wall of the male part has outer threads which are in engagement with corresponding inner threads of the female part, and wherein mutual rotation of the male part and the female part causes the length of the sleeve to be changed. The invention also relates to manufacture and use of such a sleeve.

After casting of concrete walls and foundations it is desirable to have the possibility of running cables and pipes transversely through the concrete wall or the foundation. Holes may drilled in the finished concrete wall

for this purpose, which, however, is a slow and expensive process, and furthermore vibrations, if any, can weaken the strength of the concrete. Another known and better method is to mount sleeves, e.g. pipes of plastics or metal, at predetermined positions before the casting of the concrete wall or the foundation.

Thus, the literature describes various systems where, prior to casting, a sleeve is arranged between the forming boards used for confining the pouring. Various mechanisms are known for adapting the sleeve to the distance between the forming boards.

US Patent 5 405 119 thus describes an adjustable sleeve where two pipes as male part and female part may be telescopically displaced mutually. The two pipes are fixed mutually by a clamp. The ends are cups which are in intimate engagement with the boards. The technique is only suitable for casting where formwork is used. This type of sleeve is difficult to use, because the two parts have to be pressed vigorously away from each other to create friction against the formwork while tightening the clamp. This is difficult, and therefore the sleeve will easily be a poor fit, which involves the risk that it falls off during casting. The sleeve is moreover provided with a strong rubber band, which is arranged interiorly, and which is to keep the parts together during mounting. This rubber band is in the way when the sleeve is subsequently to be used, and must therefore be removed.

US Patent 4 079 912 describes another adjustable sleeve where the length is adapted by screwing two threaded pipes relative to each other. The distance of the forming boards is ensured by a threaded member which extends

through the sleeve. The technique can be used only for casting where formwork is used, and also involves several other negative aspects. Including that the holes in the formwork for the threaded member must be drilled precisely for the threaded member to be passed through them. Frequently, the formwork is so large that a person cannot both hold the sleeve and simultaneously move the threaded member through it. That is that two persons are required for mounting, which is unduly expensive. After pouring and setting of the concrete, the threaded member must be removed for the formwork to be removed. Also the internal walls must be removed. The sleeve is provided with these to invent ingress of concrete during pouring and to stabilize the threaded member.

When casting a foundation, however, it is common that the earth walls produced by the excavation constitute the casting form. In this case, the above-mentioned known sleeves cannot be used, because the earth walls are not smooth and even like the forming boards.

A sleeve for casting both with and without a formwork is known from US Patent 4 119 293. This patent concerns a sleeve which consists of a male pipe enclosed at its ends by two female pipes which are provided with outwardly facing serrations. Interiorly in the male pipe there is a strong spring mechanism which is released by the withdrawal of a release pin, whereby the spring mechanism pushes outwardly on the female pipes. This causes the female pipes to be pushed out, and the serrations are pressed into the earth walls or the formwork, and the sleeve is kept in place owing to the spring force and the tip of the engagement of the serrations. The technique described is vitiated by several drawbacks, including

that the spring mechanism is expensive to manufacture, and particularly that it has to be removed before the sleeve can be used. The spring mechanism can moreover involve risks in the manner of a fox trap, when it is compressed for insertion into the male pipe and again when it is to be removed. In addition, it takes a great effort to remove the female pipes in order to withdraw the spring mechanism.

A further drawback is that if a stone, a root of a tree or another object is encountered, then the engagement will be very poor, and the sleeve will no be a tight fit either.

An object of the invention is to provide a method of forming a cavity in the casting of preferably parallel earth walls, wherein the earth wall is used as a casting form, and wherein a sleeve is embedded, which breaks through the earth wall and achieves a firm engagement with it at a desired depth.

Another object is to provide a method which allows the sleeve to be mounted easily by one person, and which does not require that parts of the sleeve subsequently have to be removed before the sleeve is to be used.

The novel and characteristic aspect of the invention is inter alia that the male part and/or the female part comprises a means intended to break through the surface of the earth walls for forming an engagement with it, said means being rotated so as to saw a ring-shaped hole in the earth wall.

This ensures that objects that might present an obstacle to the formation of the engagement are removed by the sawing, and that a free passage by way of the hole is created for the means and thereby also for the male part and/or the female part. Since the hole is ring-shaped, it is moreover ensured that the earth wall remains intact both externally and internally in the means, which stabilizes and enhances the engagement, so that the sleeve is firmly arranged and is not dislocated during the casting.

As the male part or the female part can be rotated simultaneously with the means in such a manner that the male part and the female part are displaced, and the means is driven into the hole in the earth wall, it is ensured that the means can be driven in in step with the sawing. That is that it takes place simultaneously, so that the hole is not made deeper than necessary, which might cause the sleeve to become loose.

In an embodiment, the male part and the female part may be provided with a gripper device which is used for rotating the male part relative to the female part, so that this can take place in a user-friendly manner, as it is easier to apply the necessary force.

Another object of the invention is to provide a sleeve suitable for embedding in concrete, wherein the sleeve is secured in parallel earth walls in such a manner that complete engagement with said earth walls is ensured, and is also easy to install, and where no parts subsequently have to be removed in order for the sleeve to be used. A further object is to provide a sleeve which is inexpensive to manufacture.

Another novel and characteristic aspect of the invention is that the means for engagement are intended to break through the surface of the earth wall for arranging the means at a certain depth in the earth wall, and that at least one of the means is rotated so as to saw a ring-shaped hole in the earth wall into which at least the one means is simultaneously driven.

This provides the advantage of making room for the means at the sawing while said means is driven in, whereby obstacles, if any, are sawn away so that there is precisely room for the means. This results in a firm engagement with the earth wall, as material from the earth wall is just removed from the ring-shaped hole, and the means is fully enclosed on both sides. This also reduces the requirements to the strength and stability of the sleeve, which involves a saving of material.

In a preferred embodiment which is suitable for the sawing, the means comprise teeth which taper in a direction toward the end of the sleeve.

In another embodiment, the male part and the female part may be provided with a gripper device for facilitating the mutual displacement, thereby making it easier for the user to operate the sleeve.

In still another embodiment, the gripper device may comprise at least one collar which extends from the sleeve and outwards, and the cross-section of the collar varies with the circumference of the collar so as to provide suitable projections which are useful for gripping in connection with the rotation.

In a further embodiment the gripper device has a first collar which is positioned on the female part, and the gripper device has a second collar which is arranged on the male part near the end of the sleeve so as to facilitate rotation of both the male part and the female part.

As the earth walls are not even and smooth like forming boards, it has been necessary to develop a sleeve by intense studies which may be used even with an unpredictable surface structure of the earth wall. It is necessary that the ends of the sleeve seal against the earth wall so that no concrete can penetrate down into the sleeve during the casting process. It is moreover important that the sleeve is arranged sufficiently firmly in the wall so that the sleeve is not dislocated during the casting process.

It has been found that the problem is solved by arranging the ends of the sleeve at a depth in the earth wall so that the entire periphery of the outer end of the sleeve is below the surface of the earth wall. However, it is not expedient to dig the ends down into the earth wall, because the surface material of the earth wall is loosened thereby and no longer retains the sleeve sufficiently during the casting process.

Therefore, it is important that the length of the sleeve can be varied. The sleeve is thus arranged between earth walls, and then its length is varied and the means are pressed into the earth wall.

The principle of changing the length may be embodied according to the telescopic principle, where an essentially tubular female part encloses an essentially tubular male

part which is slidably arranged within the female part. It has been found to be particularly expedient if the male part and the female part are in engagement with each other by a screw mechanism. By screwing the male part relative to the female part the sleeve may be extended, and at the same time the screw movement of the ends facilitates insertion of the ends into the earth wall.

In particular, it has been found expedient to provide the ends of the sleeve with means which break through the surface of the earth, so that the means may be arranged below the surface of the earth wall. These means may be constructed in different ways, e.g. as threads which are screwed into the earth wall. However, it has been found advantageous if the means are formed by serrations or teeth at the end of the sleeve. The teeth which taper in a direction toward the end of the sleeve, serve as a saw during the rotation of the sleeve about its longitudinal axis, so that the end of the sleeve may be arranged inside the earth wall by a screw movement.

The invention will be explained more fully below with reference to the drawing, in which:

Fig. 1 shows a sleeve according to the invention,

Fig. 2 shows the female part in detail,

Fig. 3 shows the male part in detail, and

Fig. 4 shows the sleeve used between two earth walls.

Figs. 1, 2 and 3 show a sleeve 1 according to one of the embodiments of the invention. The sleeve 1 comprises a

male part 2 which is arranged in a female part 3. The male part 2 is provided with outer threads 4 which are in engagement with inner threads 5 in the female part 3. Rotation of the male part 2 relative to the female part 3 causes the length of the sleeve 1 to be changed.

Fig. 4 shows the sleeve 1 used between two earth walls 6, 6' in a trench 7 which has been dug and is to serve as a casting form for the concrete foundation.

The ends 8, 8' of the sleeve 1 are provided with means 9, 9', e.g. teeth as shown in figs. 1-3, for engagement with the earth wall 6, 6'. The teeth 9, 9' serve as a saw during the rotation of the sleeve 1 about its longitudinal axis, whereby the ends 8, 8' of the sleeve 1 may be arranged in the earth wall 6, 6' by a screw movement.

The sleeve is advantageously provided with a gripper device 10, 10' at the female part 3 and the male part 2 for facilitating the mutual displacement. The gripper device 10, 10' may be constructed in different ways and is preferably provided as collars 10, 10' which extend from the sleeve 1 and outwards.

It is evident to provide both the male part 2 and the female part 3 with such a collar 10, 10'. The collar 10 of the male part is advantageously arranged in the vicinity of the end 9' of the sleeve 1. This involves two advantages. First, a long travel of the male part 2 in the female part 3 is ensured hereby. Second, in case that the earth wall 6' in which the male part 2 is arranged is of a much softer kind than the opposite earth wall 6, the collar 10' will serve as a stop and prevent the male part 2 from being screwed very far into the earth wall 6' be-

fore the female part 3 has been screwed sufficiently far into the opposite earth wall 6.

The position of the collar 10 on the female part 3 is not so decisive, but it is advantageous that the collar 10 is far away from the end 8 of the sleeve, since, otherwise, it may be difficult to grip the collar 10 during the mounting when the ends 8, 8' of the sleeve 1 have already been screwed partly into the earth wall 6, 6'.

In a further development of the invention the cross-section of the collars 10, 10' vary with the circumference of the collars. This variation, which is shown as notches 11 in the collar 10 in figs. 1-3, also has two functions. The first function is to provide a better grip of the collars 10, 10'. The second function is as follows: If the male part 2 has been screwed into the earth wall 6' so that its collar 10' is in engagement with the earth wall 6', it is no longer possible to grip this collar 10'. Then there is the risk that rotation of the collar 10 of the female part causes rotation of the entire sleeve 1. This may happen if the earth wall 6' is of a much softer kind than the opposite earth wall 6. The construction of the collar 10, 10' in the manner shown in figs. 1-3 has shown, however, that the collar 10' when engaging the surface of the earth wall 6' offers a very great frictional resistance, so that the male part 2 will not tend to follow the rotation. This provides precisely the intended effect that rotation of the collar 10 of the female part 3 causes an extension of the sleeve 1, whereby the end 8 of the female part with the means 9 is screwed deeper into the earth wall.

A typical material for the manufacture of the sleeve 1 is metal or plastics. Plastics has the advantage that it is very durable, and that it can be manufactured e.g. by injection moulding in a simple and inexpensive manner.

The aim of the invention is to provide a sleeve 1 where both ends 8, 8' are provided with means 9, 9' for breaking through the surface of the earth wall 6, 6'. But it is within the ability of a person skilled in the art to construct a sleeve 1 where just one of the ends is provided with these means, e.g. teeth. This might be the case if the casting form for a concrete wall or a foundation is formed by an earth wall at one side, while forming boards are used at the opposite side.

PATENT CLAIMS

1. A method of forming a cavity in the casting of preferably parallel earth walls, said method comprising embedding and use of a sleeve which comprises an essentially tubular male part and an essentially tubular female part, wherein the outer wall of the male part has outer threads which are in engagement with corresponding inner threads of the female part, and wherein mutual rotation of the male part and the female part causes the male part to be displaced relatively to the female part, **characterized in** that the male part and/or the female part comprises a means intended to break through the surface of the earth walls for forming an engagement with it, said means being rotated so as to saw a ring-shaped hole in the earth wall.

2. A method according to claim 1, **characterized in** that the male part or the female part is rotated simultaneously with the means in such a manner that the male part and the female part are displaced, and the means is driven into the hole in the earth wall.

3. A method according to claim 1 or 2, **characterized in** that the male part and the female part are provided with a gripper device which is used for rotating the male part relative to the female part.

4. A sleeve suitable for embedding in concrete, wherein the sleeve is essentially tubular and has a variable length, wherein the ends of the sleeve are provided with means for engagement with the preferably parallel earth walls formed for the casting, and wherein the sleeve comprises an essentially tubular male part and an essen-

tially tubular female part, wherein the female part is slidably arranged in the male part, and wherein the outer wall of the male part has outer threads which are in engagement with corresponding inner threads of the female part, and wherein mutual rotation of the male part and the female part causes the length of the sleeve to be changed, **characterized in** that the means for engagement are intended to break through the surface of the earth wall for arranging the means at a certain depth in the earth wall, and that at least one of the means is rotated so as to saw a ring-shaped hole in the earth wall into which at least the one means is simultaneously driven.

5. A sleeve according to claim 4, **characterized in** that the means comprise teeth which taper in a direction toward the end of the sleeve.

6. A sleeve according to claim 4 or 5, **characterized in** that the male part and the female part are provided with a gripper device for facilitating the mutual displacement.

7. A sleeve according to claim 6, **characterized in** that the gripper device comprises at least one collar which extends from the sleeve and outwards, and that the cross-section of the collar varies with the circumference of the collar.

8. A sleeve according to claim 7, **characterized in** that the gripper device has a first collar which is positioned on the female part, and that the gripper device has a second collar which is arranged on the male part near the end of the sleeve.

9. Manufacture of a sleeve according to any one of the preceding claims 4-8, **characterized in** that the manufacture comprises plastics injection moulding.

10. Use of a sleeve according to claims 4-9 in the manufacture of foundations for structures.

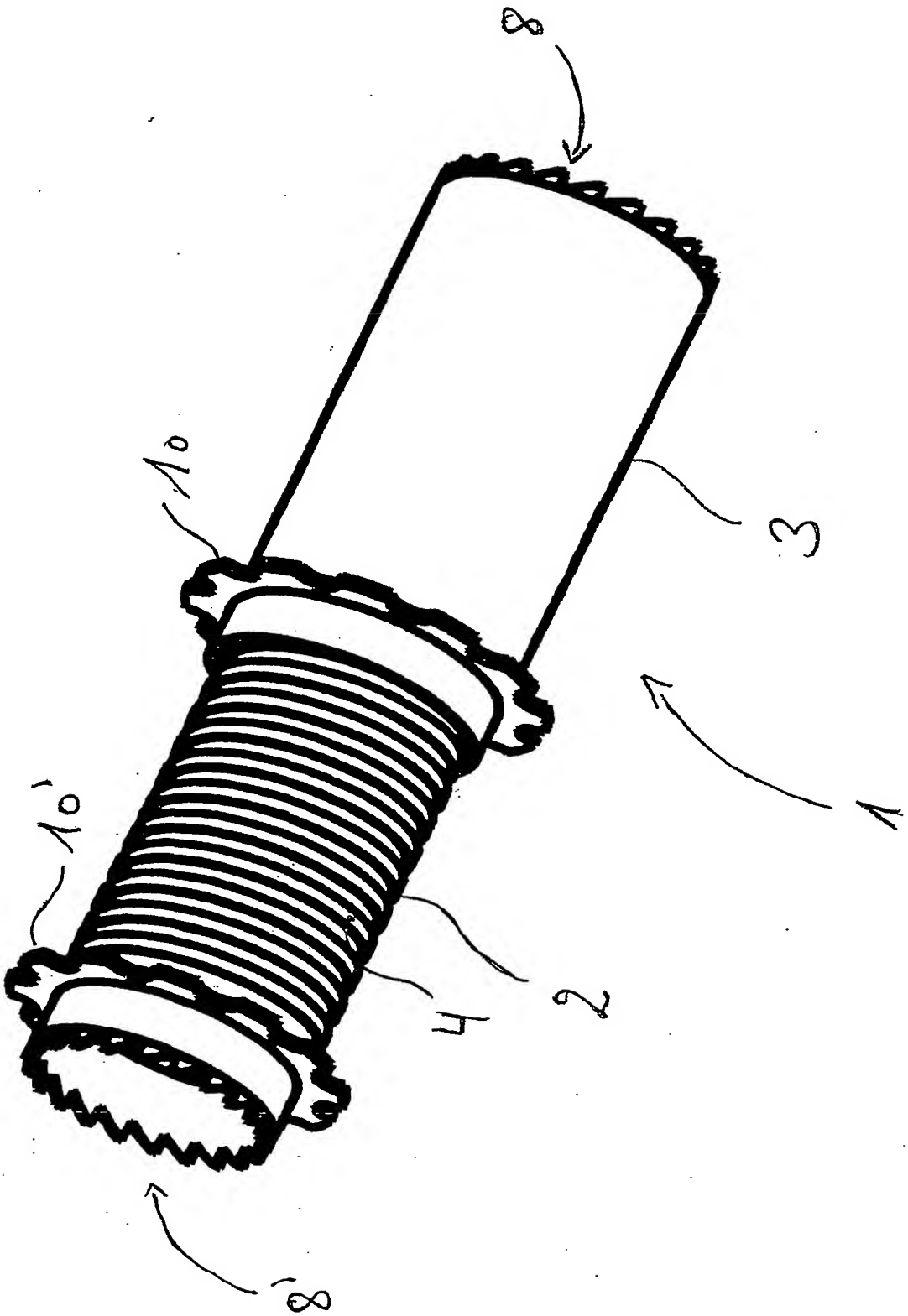



FIG. 1

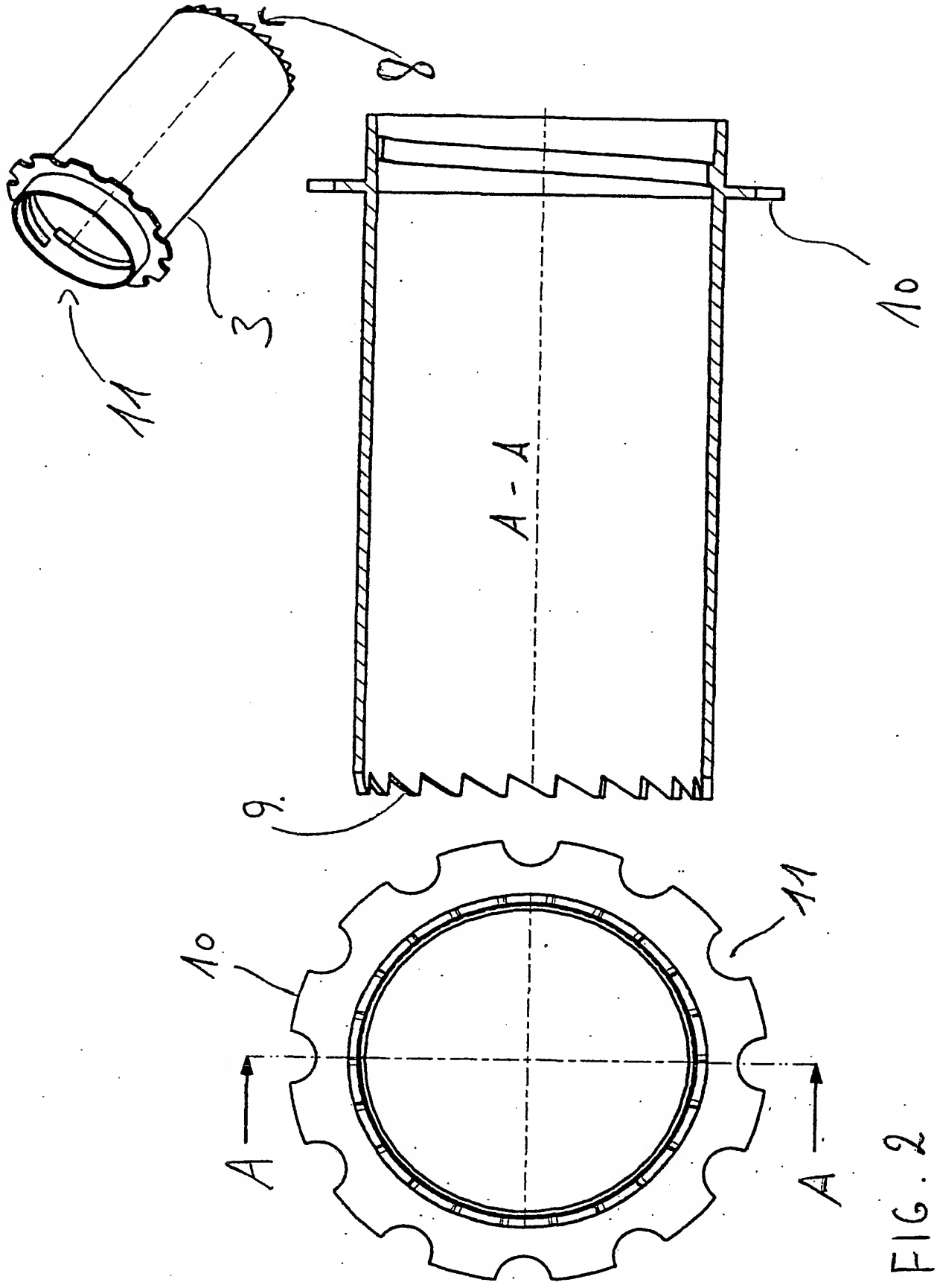



FIG. 2

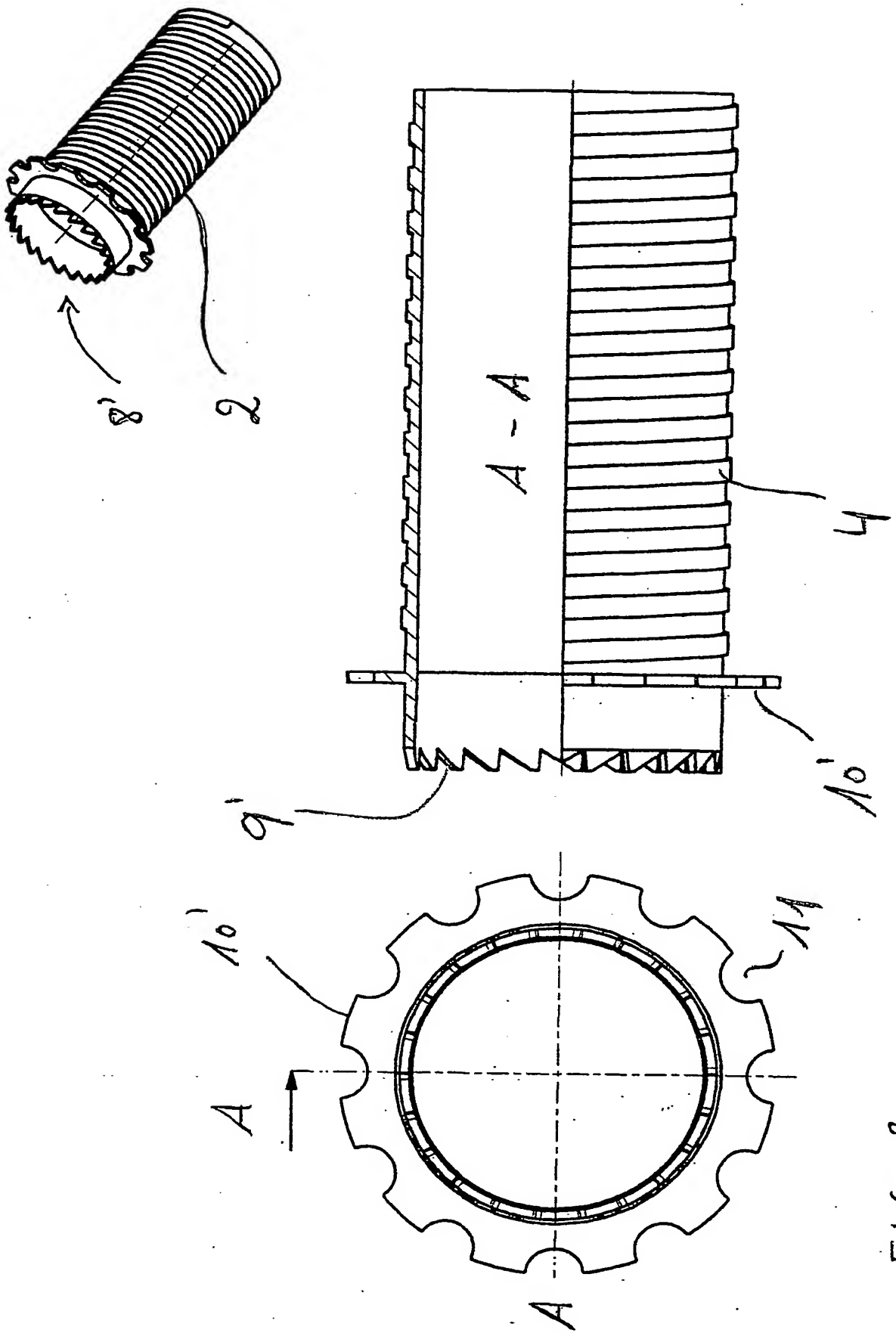



FIG. 3

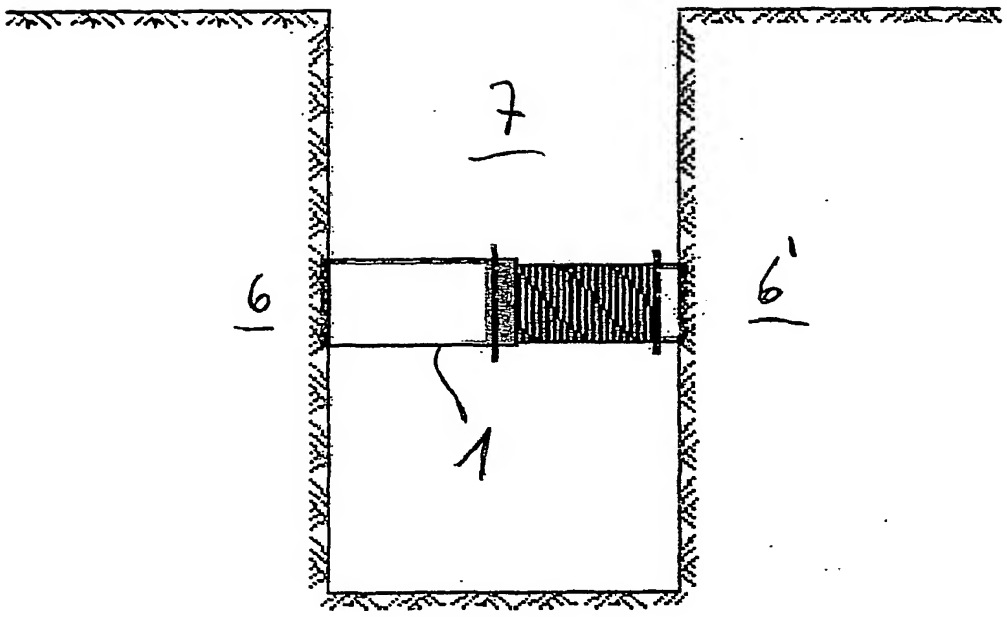



FIG. 4

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 01/00545

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E04G 15/00 // E04G 17/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B28B, E04G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 5405119 A (J.V. MAGUIRE), 11 April 1995 (11.04.95), figure 1, abstract<br>--- | 1-10 |
| A | US 4079912 A (C.E. HAYDOCK), 21 March 1978 (21.03.78), figure 1, abstract<br>--- | 1-10 |
| A | US 4119293 A (E.A. DIENER), 10 October 1978 (10.10.78), figure 1, abstract<br>---<br>-------- | 1-10 |

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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| Date of the actual completion of the international search | Date of mailing of the international search report |
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| 15 November 2001 | 20 12 2001 |
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

01/10/01

International application No.
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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 5405119 A | 11/04/95 | NONE | |
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| | | DE 2751231 A | 24/05/78 |
| US 4119293 A | 10/10/78 | NONE | |